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University of Agricultural Sciences and Veterinary Medicine
"King Michael I of Romania" from Timisoara
Faculty of Horticulture and Forestry

Monitorization of *Quercus robur* L. species in the Garden of Roman Catholic Episcopal Palace of Oradea

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Introduction

Fig. 1 The Garden of the Roman Catholic Episcopal Palace, 2020

Sourse: :https://www.google.com/maps/search/google+maps/@47.0683973,21.9303657,439m/data=!3m1!1e3

The garden of the Roman Catholic Episcopal Palace was created once the most impressive baroque catherdal's building project was launched.

The garden (fig. 1) has 6hectares contains approximately over 600 dendrological species.

In front of the palace, an English garden was created in the beginning of 1900's(fig 2.), including large ornamental trees such as Silver birch *Betula pendula* L*., Common Oak Quercus robur* L. and other Magnolia species.

Fig. 2 Landscape view The Roman Catholic Episcopal Palace and the Cathedral

Souse: https://www.baroque-garden.ro/ro/fotografii-arhiva/

During the 2019 dendrological survey, every tree of this garden has been identified then some of these were found quite special and spectacular. Among these some species are exotic, other has witnessed some important historical events, these species are:

1. *Corylus colurna* L. – 100 years
2. *Ginkgo biloba* L. – 100 years
3. *Gymnocladus dioicus* (L.) K. Koch- 60 years
4. *Magnolia x soulangeana* – 90 years
5. *Quercus robur* L.– 180 years
6. *Quercus rubra* L. – 150 years
7. *Salix babylonica* L.– 110 years
8. *Sequoiadendron giganteum Lindl.* - 140 years
9. *Aesculus hippocastanum* L. – 120 years

The garden also contains a large Magnolia collection(fig. 3 - 5.) including:

- *Magnolia x soulangeana*
- *Magnolia kobus* DC.
- *Magnolia grandiflora* L.
- *Magnolia denudata* Desr.

Fig. 3 *Magnolia x soulangeana*
Photo: Kleszken Timea, 2020

Blooming Magnolia trees in 1933

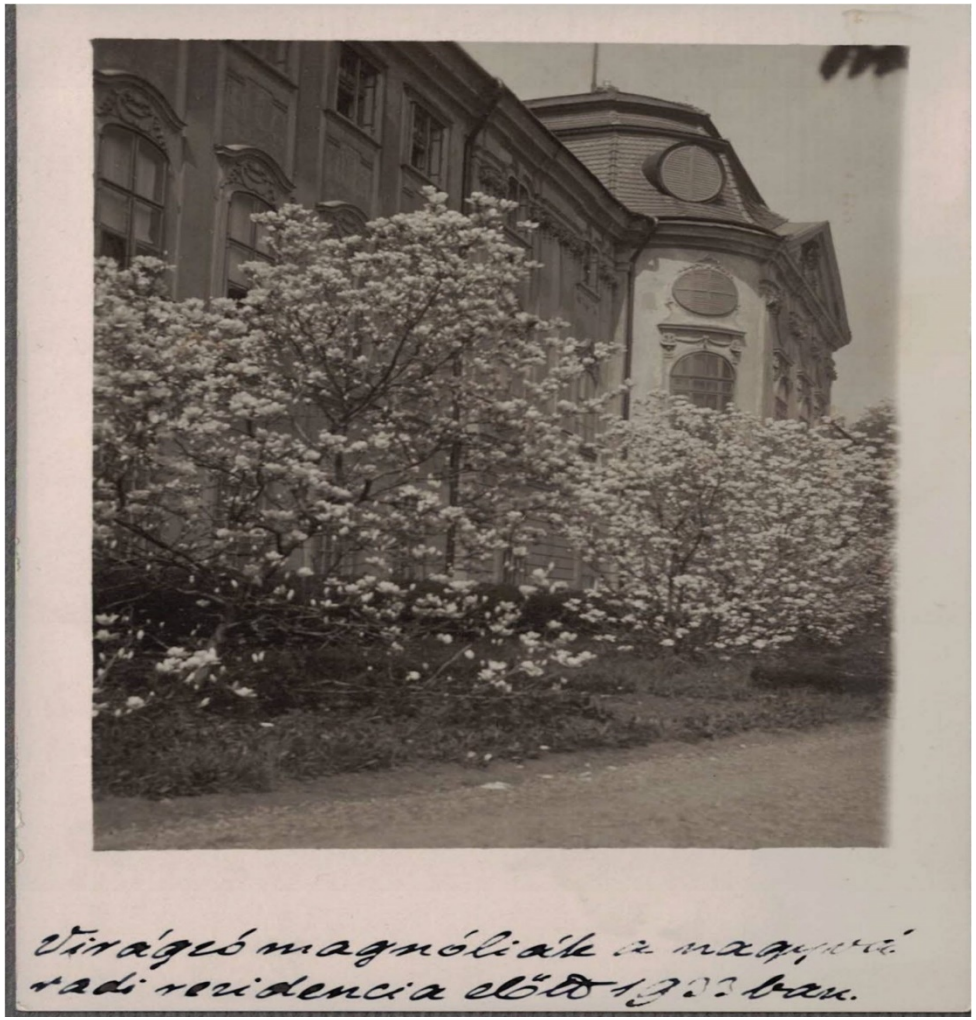

Fig. 4 Blooming Magnolia
Photo: Archive of the Roman Catholic Episcopal Palace
https://www.baroque-garden.ro/ro/fotografii-arhiva/

Fig. 5 Blooming secular *Magnolia* trees,
Photo: Kleszken Timea, 2021

Other secular trees are the Wild chestnuts (*Aesculus hippocastanum* L (fig 6.) in the inner courtyard, being part of it even nowadays (fig 7.)

Fig 6. Wild chestnuts (*Aesculus hippocastanum* L.) 1930,
Photo: Archive of the Roman Catholic Episcopal Palace
https://www.baroque-garden.ro/ro/fotografii-arhiva/

Fig 7. Wild Chestnuts (*Aesculus hippocastanum* L.) *nowadays*
Photo: https://www.baroque-garden.ro/ro/fotografii-arhiva/

Materials and methods

- Between all these spectacular species, the oldest one is although a Common Oak tree known as *Quercus robur* L. (Fig 8) which has witnessed the most important historical events of the 20'th century for example: the Austro-Hungarian Empire, both World Wars, the Romanian communism and many more.
- The tree has become 29meters tall, the crown has grown to spectacular dimensions which has initiated an inclination, then the large and dry branches stared to fall down, becoming a danger to the visitors.

Fig 8.The oldest tree from the Garden of the Roman Catholic Episcopal Palace,Oradea
Photo Kleszken Timea, 2019

- To save this spectacular Oak tree, in 2019, our team decided to ask professional help to analyse thesituation of this tree and finding the best solution without harming the old tree too much.

Fig 9. Coronamentul stejarului de 180 de ani, Foto Kleszken Timea, 2019

The analysis begins in first phase, with a tree radiography assisted by an acoustic tomograph, which detected the internal health state of this old oak tree.

The second phase consists the examination of the visible deformations on the trunk. (fig. 10).

To obtain more information, 3 layers with different height were measured from the base at 40/100/150cm height (fig. 11).

Fig. 10 Manual examination
Photo Kleszken Timea, 2019

Fig. 11 Tomograph installation at 150cm
Photo: Kleszken Timea, 2019

How does this process perform?

The tomograph (fig. 12) is a new system that measures the speed of sound movement through hard wood.

As the sound wave is constant in solid healthy wood, measurements can be made fast between one point of the trunk and another. If there is rot between the test points, then the measured sound wave is lower. (Fig.14-15)

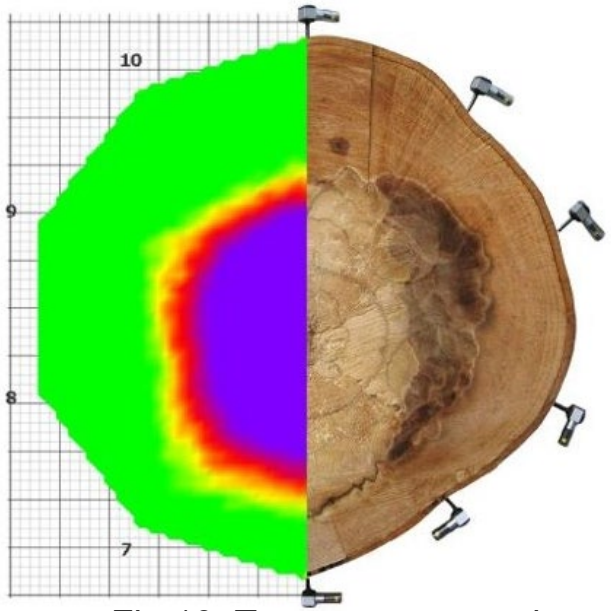

Fig 13. Tomogram example
Photo:
https://www.fakopp.com/en/product/arborsonic/

The software calculates all the recorded data in a complete test and generates an image called a *tomogram*. Later, we can interpret the image, taking into account the tree itself and the surrounding factors.

Fig. 12 Fakopp 3D. Arbosonic Acoustic Tomograph
Photo: Kleszken Timea

Tomograms of the 180 years old Oak tree

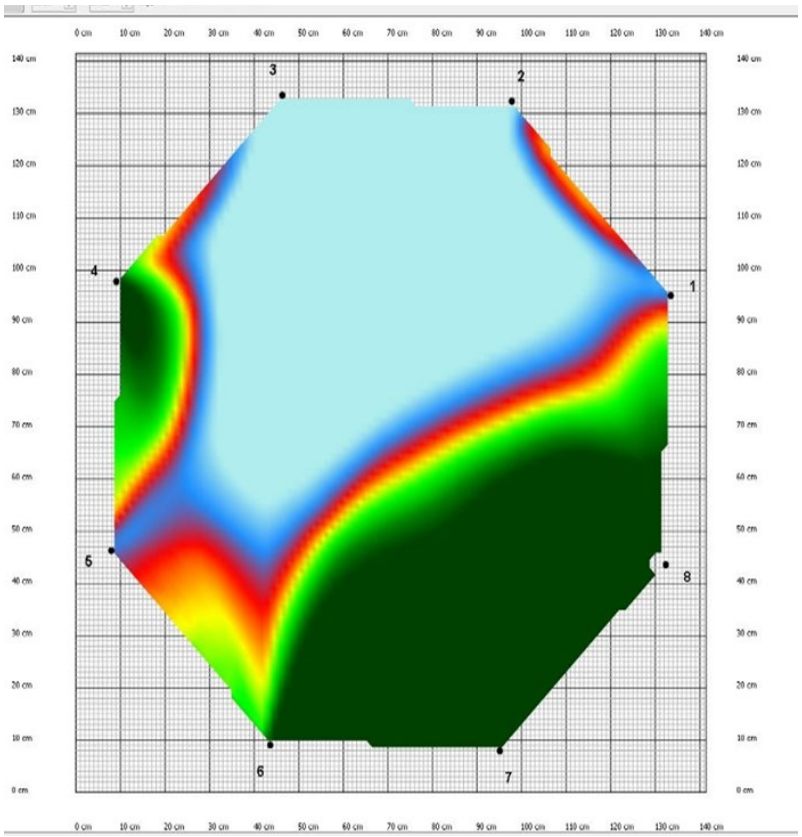

Fig. 13 The internal health status of the 180year old Oak at 150cm

Photo: Softwear Fakopp Bt. Arborsonic 3D

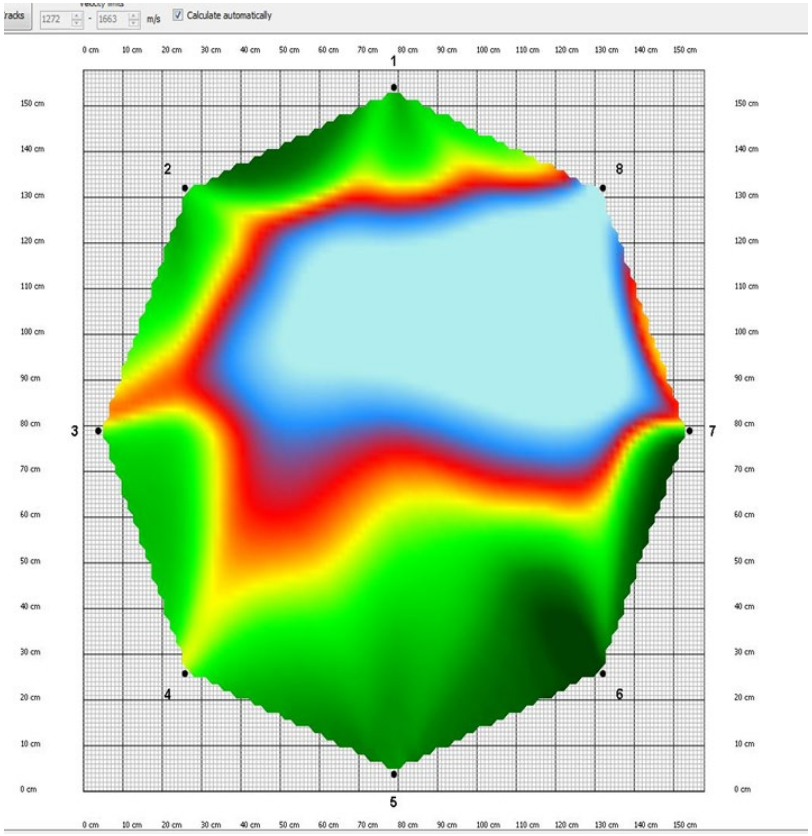

Fig. 14 The internal health status of the 180year old Oak at 100cm,

Photo: Softwear Fakopp Bt Arborsonic 3D

Results and discussions

The spectacular crown (fig. 15) was reduced in November 2019 (fig. 16) and became sustained (fig. 17) offering stability and reducing it's risk of collapse.

Fig. 15 Before prunning

Photo: Kleszken Timea, september 2019

Fig. 16 After prunning

Photo: Kleszken Timea, November 2019

The stabilization process

- As a final task after the pruning the old Oak tree gained stability with 3 metal pillars.
- The injuries caused by the pruning were treated in order to stop the intruding pathogens
- The entire process took 3 months.

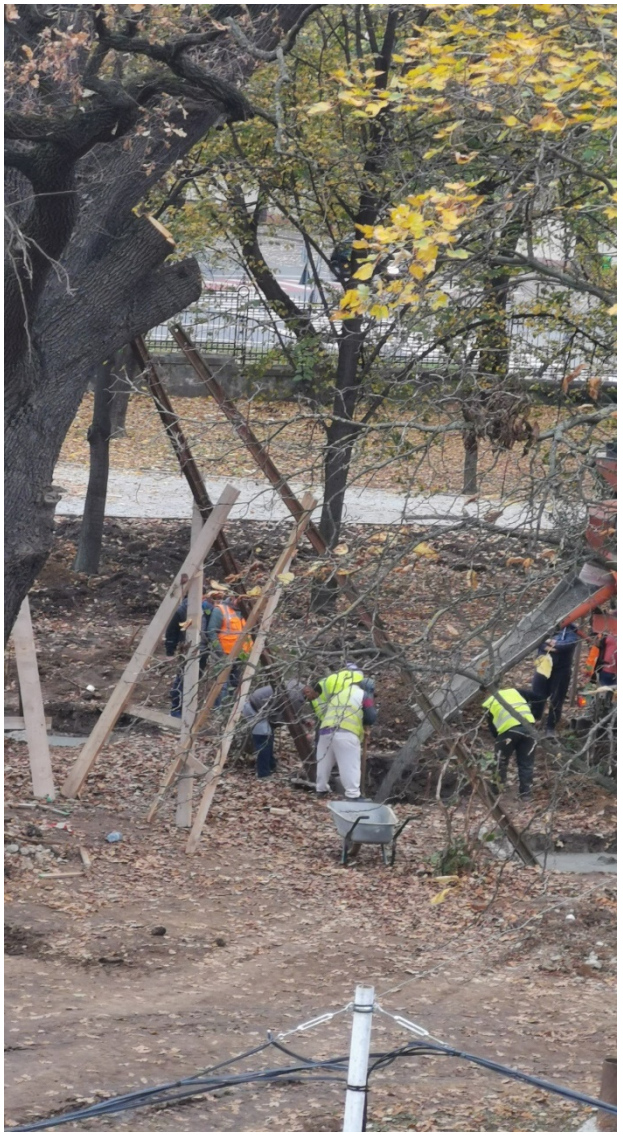

Fig. 17 The stabilization process
Photo Kleszken Timea, november 2019

In addition to the old oak, there were other valuable species that were examined in this historical garden for example *Corylus colurna* L. (fig 18.), *Ginkgo biloba* L, *Gymnocladus dioicus* L.

Other species that are truly monumental the three *Sequoiadendron giganteum* Lindl.species from Oradea (fig 19) and from Maderat, Arad country were also carefully examined in 2020 and 2021.

Fig. 18 Installing the tomograph on *Corylus colurna* L,
Foto Kleszken Timea, december 2019

Fig. 19 *Sequoiadendron giganteum* Lindl.
During the measurements,
Photo Kleszken Timea, July 2020

Conclusion and recomandations

One year after the beginning of the whole support project, the old oak shows positive vital signs (fig.20), hopefully the visitors will enjoy it's presence many years.

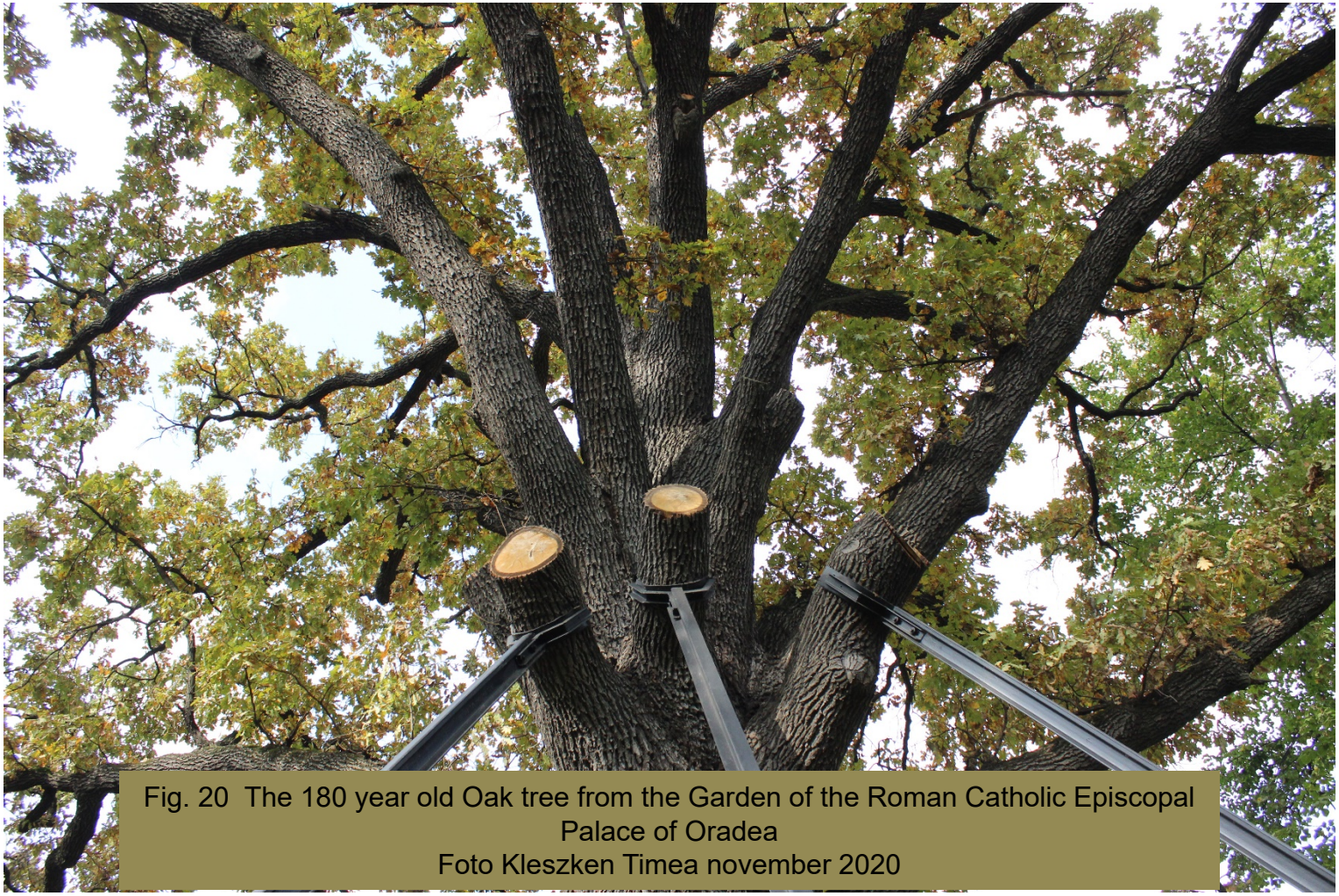

Fig. 20 The 180 year old Oak tree from the Garden of the Roman Catholic Episcopal Palace of Oradea
Foto Kleszken Timea november 2020

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Thank you!